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ABSTRACT

This instructor's lesson plan guide on shock and fluid therapy is one of fifteen modules designed for use in the training of emergency medical technicians (paramedics). Six units of study are presented: (1) body fluids, electrolytes and their effect on the body, and the general principles of fluid and acid base balances; (2) characteristics of blood and its components, and the indications and hazards of blood transfusion; (3) causes, signs, symptoms, and treatment of dehydration and overhydration; (4) the classification, signs, symptoms, and treatment of shock; (5) practice in initiation and termination of an intravenous lifeline (IV), management of an improperly functioning IV, and application of the military anti-shock trousers; and (6) clinical experiences in the emergency department, intensive care unit/coronary care unit, and with the IV team. Each unit contains these elements: behavioral objectives, teaching procedures, content outline, demonstration outlines, needed equipment and materials, and guidelines for activities to be performed by students applying the skills. Skill evaluation sheets are provided. It is suggested that each module can be presented individually or combined with other moduels to construct a course for a selected group of students. (CE 017 514 is a course guide for use in program planning and administration of the modules.) (JH)

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ED158061

National Training Course
EMERGENCY MEDICAL TECHNICIAN
PARAMEDIC

INSTRUCTOR'S LESSON PLANS

Module III

Shock and Fluid Therapy

CE017517

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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U.S. Department of Transportation / National Highway Traffic Safety Administration

National Training Course

EMERGENCY MEDICAL TECHNICIAN
PARAMEDIC

INSTRUCTOR'S LESSON PLANS

Module – III

Shock and Fluid Therapy

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HOW TO USE THE INSTRUCTOR LESSON PLANS

NOTES

The *Instructor Lesson Plans* are guides for teaching an advanced-level training program for emergency medical technicians. The *Plans* cannot be used by the instructor to develop the competency to conduct the program; the instructor should have this as a prerequisite to teaching the course.

The *Instructor Lesson Plans* are comprised of 15 modules, each containing the information and instructions needed to conduct a program on a particular subject. Each module can be used by itself or in concert with other modules.

Each module is subdivided into instructional units that deal with a particular segment of the module subject. Generally, the units contain the following components:

- *Performance Objectives.* These are classified as knowledge (K) objectives or skill (S) objectives. They are written in behavioral terms so they can be evaluated either through observation of student activities or through results obtained under specified conditions.
- *Unit Activities.* Reading assignments, reference materials, and outside activities are presented for both the students and the instructor. If the activities are identical, only the instructor's activities are presented.
- *Equipment and Materials.* Educational equipment includes chalkboard, overhead projector, slide projector, and screen. Medical equipment and materials required are drawn from those listed in Appendix F of the *Course Guide*.

- *Content Outline.* This presents the topics to be covered during the presentation of the unit. Where appropriate, it is divided into single skills or concepts. This approach gives the instructor the flexibility to add or delete specific skills and information. The content outline also provides directions to the instructor indicating when the use of demonstrations or group discussions would be most appropriate.

  Because the units are designed to be taught by technically competent instructors, the content outlines are not specific; they only enumerate topics and subtopics. It is expected that the instructor's skill and knowledge will supplement the depth of the course content outline. The instructor is encouraged to prepare additional notes.

- *Demonstration Outlines.* These are designed to present procedural steps that are important in performing the particular skill or calculation. Steps that are critical or that may lead to common errors are emphasized. Where critical steps exist, these outlines suggest what should be demonstrated.
- *Practice Sessions.* These sessions serve as guides to activities to be performed by students applying the skills. They may be performed in the classroom or assigned as homework. During classroom practice sessions, the instructor will be available to observe and correct student performance and to answer any questions.
- *Skill Evaluations.* The skill evaluation sheets provide checkpoints for the instructor to use to insure that students are following appropriate procedures or sequences. Skill evaluation sheets also provide a convenient method for feedback to students having particular problems with a given skill, and for monitoring a student's progress in attaining skill objectives.

  The skill evaluation should occur only after the students have had an opportunity to practice the skill under the supervision of the instructor. The skill evaluation sheets can be distributed during, or before, the demonstration or practice session. Thus, they can be used as a job aid during practice. They should not be used, however, as a job aid while the student is being evaluated. The sheets are designed to provide a learning and evaluation tool and are not intended to mandate performance in the field in a set

NOTES

manner, irrespective of the patient's condition or situation.

Satisfactory performance of a given skill is defined as the correct performance of all steps in the proper sequence. The instructor's judgment is required to define correct performance and sequence of steps in a skill. Skill evaluations may be repeated at intervals throughout the course to assess skill decay and the need for remedial practice. Some instructors may wish to test skills immediately after they have been learned and again at the conclusion of the course.

The alphanumeric coding system is used to identify the various modules and units. When you see, for example, in Module II, **3.6.1.K,** the **3** indicates the unit, the **6** indicates the main instructional topic, the **K** indicates the teaching objective (in this case knowledge), and the **1** indicates the subsection of the major topic outlines in **3.6.**

To illustrate further, **3.6.1.K** would translate into:

3 = Unit number
6 = The main topic of the instructional section (The first two numbers—e.g., **3.6**—refer to a major heading in the unit content outline.)
1 = A subsection of the major topic outlined in **3.6** (This number relates to the number of objectives listed under skill or knowledge objectives and not to the content outline.)
K = Knowledge objective
S = Skill objective

The three-digit reference numbers (e.g., **3.6.1**) within each module refer to the topical section in that module only. For example, in Module II, any topical heading with **3.6** as the first two digits refers to the discussion of the components of patient assessment in Unit 3.

A visual presentation of Unit 3, by Module II, of the coding system is presented on the following pages.

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SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

- Abdomen
- Extremities

3.6.1.K Given a situation describing a patient with a possible illness or injury who may or may not be able to communicate, the student should be able to describe the procedure for evaluating the patient described. Minimally, the student should include the appropriate primary assessment and specify the order of the four components of the secondary assessment and the areas of the assessment that would be emphasized.

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the demonstration, auscultation of the lung, heart, and abdominal sounds.

3.6.1.S Given a student posing as a communicative patient, the student should be able to demonstrate the procedure for conducting a patient assessment when the patient is suspected of having the following:

SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

8. Practice Session 3

3.6. Four components of assessment (order)

A. If the patient can communicate, determine if he has a medical or trauma-related problem.
   1. If a medical problem, the general order should be:
      a. Evaluate the diagnostic and vital signs.
      b. Develop the patient's history.
      c. Examine for a medical problem.

Skill Evaluation 3.6.1.S: Assessment of Noncommunicative, Unconscious Patient With Suspected Trauma-Related Problem

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Fellow student posing as a victim
Stethoscope

Clinical Training

NOTES

To present this program, it will be necessary to have access to the clinical units listed below. If a unit is not available, adjustments should be made to insure that the activities proposed for that unit are included in others. Specific guidelines for the clinical units are included in the modules. The student's training should be supervised in each of the following clinical areas:

- Emergency department
- Intensive care unit/coronary care unit
- Operating/recovery room
- Intravenous (IV) team
- Pediatric unit
- Labor suite/delivery room/newborn nursery
- Psychiatric unit
- Morgue
- Mobile intensive care unit

Sample forms for maintaining student activity records are included in the *Instructor Lesson Plans*. The forms are designed so that the medical director can determine the number of times, and how successfully, a student has performed a skill. The medical director also will be able to determine how much time the student needed to become proficient in the skill. Further, the medical director will be able to evaluate student performance under a number of preceptors, because certain skills are repeated in various clinical units (e.g., initiating an IV is performed by the student with the IV team and in the emergency department and intensive care unit).

Although the clinical experience is listed with the module, it need not be presented each time, even if a number of modules are being presented.

Testing and Evaluating the Student

It is recommended that each student be evaluated on proficiency of skill and knowledge at the completion of each module. Skill evaluation sheets have been provided for each skill in each unit. These sheets can be used as guides for evaluating the student's skill proficiency. The evaluation of the knowledge objectives is left to the discretion of the instructor, according to predetermined objectives.

Testing of knowledge should stress areas of clinical relevance over basic science. No matter what type of evaluation system is used, students should be kept informed of their progress and should be given additional activities to supplement weak areas.

As previously stated, the emphasis is on student competency, rather than on the total number of hours the student is involved in the program. Thus, it is possible for the student to be tested and given credit for any module. The medical director should not assume the student's competency simply because of prior training, but should develop an evaluation method to determine the student's proficiency based on first-hand observation and experience. With this type of method, it is possible for students to receive credit for prior training experience. This would be especially applicable for those modules that are primarily a review of skills concerned with Emergency Medical Technician-Ambulance; for example, soft-tissue injuries and rescue.

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MODULE III SHOCK AND FLUID THERAPY

INTRODUCTION

Prerequisites

The students must have successfully completed the following modules:

I. The Emergency Medical Technician, His Role, Responsibilities, and Training

II. Human Systems and Patient Assessment

Description of Module

Following is a summary of the topics discussed in this module:

Unit 1. Fluids and Electrolytes: Discusses body fluids, electrolytes, and their effect on the body, and the general principles of fluid and acid-base balances.

Unit 2. Blood and Its Components: Discusses the characteristics of blood and its components, and the indications and hazards of blood transfusion.

Unit 3. Disorders of Hydration: Discusses the causes, signs, symptoms, and treatment of dehydration and overhydration.

Unit 4. Shock: Discusses the classification, signs, symptoms, and treatment of shock.

Unit 5. Techniques of Management: Designed to give the student the opportunity to practice the following skills in an educational setting:

- Initiation and termination of an intravenous (IV) lifeline using a winged infusion needle, an over-the-needle catheter device, or a through-the-needle catheter device
- Management of an improperly functioning IV
- Application of the Military Anti-Shock Trousers

Unit 6. Clinical Experience: Includes the following:

- Emergency department
- Intensive-care unit/coronary-care unit
- IV team

Upon completion of this module, the student should have basic competence in the skills and knowledge objectives.

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UNIT 1

FLUID AND ELECTROLYTES

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

1.1.1.K Given a list of definitions, the student should be able to select the one that best defines:

- Intracellular fluid
- Extracellular fluid
- Intravascular fluid
- Interstitial fluid
- Colloid
- Crystalloid
- Total body water

1.2.1.K Given a list of definitions, the student should be able to select the one that best defines:

- Electrolyte
- Ion
- Cation
- Anion

1.2.2.K Given a list of anions and cations, the student should be able to state which are chiefly extracellular and which are chiefly intracellular. Ions will include K^+, Cl^-, Na^+, Ca^{++}, Mg^{++}, HCO_3^-.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

NOTES

1.2.3.K Given a list of statements, the student should be able to select the one that best describes the relationship of cations and anions in the body (e.g., number of cations = number of anions).

1.2.4.K Given a list of signs and symptoms, the student should be able to select those signs or symptoms associated with imbalances of Na^+, K^+, or Ca^+. These signs or symptoms will include:

- T-wave changes on electrocardiogram (EKG)
- Muscular instability
- Thirst
- Carpopedal spasm

1.3.1.K Given a list of definitions, the student should be able to select the one that best defines the process of osmosis.

1.3.2.K Given a list of situations describing two solutions of different concentrations separated by a semipermeable membrane, the student should be able to indicate the direction the water will flow.

1.3.3.K Given a list of statements, the student should be able to select the one that best describes how osmosis affects water distribution.

1.3.4.K Given a list of definitions, the student should be able to select the one that best defines:

- Isotonic solution
- Hypertonic solution
- Hypotonic solution

1.3.5.K Given a list of IV solutions, the student should be able to recall the osmotic effect of the solution when introduced into the body.

1.4.1.K Given a list of definitions, the student should be able to select the one that best defines:

- pH
- Buffer
- Acidosis
- Alkalosis

1.4.2.K Given a list of statements, the student should be able to select the one that best describes the roles of carbonic acid (H_2CO_3) and carbonate in maintaining acid-base balance.

1.4.3.K Given a list of causes, the student should be able to select the cause for various imbalances of acid-base equilibrium.

1.4.4.K Given a list of fluids, including D5W and D5/normal saline, the student should be able to identify which fluids increase the circulating blood volume.

Instructor Activities

Assign the material referred to below during the class period immediately before beginning the unit.

- Chapter 3, Unit 1, of the *Text*
- Knowledge objectives for this unit

Prepare a lecture and discussion session following the content outline on page III-6. Use a visual presentation when describing concepts such as the process of osmosis.

Answer the students' questions.

Test the students after completing the first four units or the entire module. Use the knowledge objectives as a guide.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Materials

Knowledge objectives (optional)
Text

NOTES

Content Outline

NOTES

Introduction

- Review the knowledge objectives.
- Review the topics.
  - — Body fluids
  - — Electrolytes
  - — Osmosis
  - — Acid-base balance

1.1. Body fluids

A. Point out that they consist of water and dissolved substances.
B. Discuss major subdivisions.
   1. Discuss intracellular fluid—contained within the cells.
   2. Discuss extracellular fluid.
      a. Intravascular fluid (plasma)—inside blood vessels
      b. Interstitial fluid—outside blood vessels
   3. Draw a diagram illustrating the relationship of the three "compartments."
   4. Define "compartments"—spaces occupied by body fluid.
C. Point out that dissolved substances are present in all compartments, but may vary in concentration; for example, concentration of intracellular versus extracellular sodium.

1.2. Electrolytes

A. Electrolytes are molecules that dissociate to form ions.
B. Ions are molecules or elements that have a positive or negative charge.
   1. Cation (+)—Na^+, K^+, Ca^{++}, Mg^{++}
   2. Anion (–)—Cl^-, HCO_3^-, organic acids and inorganic acids.
C. Ions migrate to the pole of the opposite charge.
D. The body tries to balance positive and negative charges.
E. Electrolyte patterns are formed by compartment.
   1. Intracellular fluid—K^+ (potassium)
   2. Extracellular fluid

a. Na^+ (sodium)
b. Cl^- (chloride)

F. Electrolytes are involved in basic processes.
1. Water distribution (explained later)
2. Osmotic pressure (explained later)
3. Neuromuscular irritability

G. Electrolyte imbalances have an effect on the activities of the body. For example, Na^+ is responsible for fluid level.

NOTES

1.3. Osmosis

A. Describe a semipermeable cell membrane.
1. Totally permeable to water
2. Semipermeable to some electrolytes
3. Tendency to equalize concentrations on both sides of a membrane

B. Define osmosis.
1. Discuss osmosis as the passage of water from an area of lower concentration to one of a higher concentration of particles.
2. Draw a diagram and give an example of osmotic effect.
3. Define osmotic pressure—pressure set up by the water as it moves from an area of lesser concentration to one of higher concentration.
4. Point out that the osmotic effect controls water distribution based on molecular concentrations in the compartments--give an example.

C. Discuss the importance of osmosis in selecting IV solutions.
1. Point out that IV fluids must be chosen with respect to their effect on osmotic pressure.
2. Emphasize that osmotic relationships must be maintained.
3. Define the following solutions:
a. Isotonic solution
(1) Point out that it simulates the salt concentration of plasma.
(2) Point out that it has no effect on osmotic pressure.
(3) Give an example—0.9 percent NaCl solution (normal saline).

b. Hypotonic solution
   (1) Point out that it is less concentrated than body fluid.
   (2) Point out that it causes fluid to enter a cell which then expands.
   (3) Give an example—0.50 percent normal saline.
c. Hypertonic solution
   (1) Point out that it is more concentrated than body fluid.
   (2) Point out that it causes fluid to leave the cell.
   (3) Give an example—D5W (50 percent dextrose).

4. Discuss the following IV solutions, their components, and their effect with respect to osmotic pressure:
   a. Dextrose solutions (5 percent dextrose in water)
   b. Sodium chloride solutions (0.9 percent NaCl in water, normal saline)
   c. Lactated solutions (Ringer's lactate)
   d. Plasma expanders (plasmanate or other plasma substitute)

1.4. Acid-base balances

A. pH definition
   1. pH is the reciprocal of the logarithm of the hydrogen ion concentration. ($pH = \overline{\ }\log CH^{+}$).
   2. pH describes acidity.
      a. 7.0 is neutral
      b. Greater than 7.0 indicates an alkaline solution
      c. Less than 7.0 indicates an acidic solution
   3. The normal physiologic range is 7.35–7.45.

B. Buffer System
   1. Discuss the purpose of a buffer.
   2. Give an example—bicarbonate and carbonic acid.

C. pH determination is based on the ratio of carbonic acid and bicarbonate.
   1. The patient may be acidotic ($pH < 7.35$) if:
      a. Carbonic acid (H_2CO_3) increases
      b. Bicarbonate decreases (HCO_3^-)
   2. The patient may be alkolotic ($pH > 7.45$) if:
      a. Carbonic acid (H_2CO_3) decreases
      b. Bicarbonate increases (HCO_3)

NOTES

D. Examples of the four conditions mentioned (covered again in Modules V and VI):
   1. Carbonic acid (H_2CO_3) increase occurs when not enough carbon dioxide is removed through respiration (hypoventilation).
   2. Carbonic acid (H_2CO_3) decrease occurs when too much carbon dioxide is removed through respiration (hyperventilation).
   3. Excess acid, when combined with the bicarbonate buffer, forms carbonic acid (H_2CO_3) = diabetic ketoacidosis.
   4. Bicarbonate increase occurs when there is an excessive ingestion of sodium bicarbonate.

E. Discuss the importance of acid-base balances.
   1. Respiratory activity influences the acid-base balance in the body (discussed further in Module V).
   2. If the cells do not receive adequate oxygen for metabolism, as in shock or asphyxia, acids are formed that consume bicarbonate causing acid-base balance changes (discussed further in Modules V and VI).

Summary

- Review the knowledge objectives.
- Review the topics:
  - — Body fluids
  - — Electrolytes
  - — Osmosis
  - — Acid-base balance
- Ask for questions.

NOTES

UNIT 2

BLOOD AND ITS COMPONENTS

Knowledge Objectives

NOTES

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

2.1.1.K Given a list of functions, the student should be able to select the one(s) that is (are) a function of the blood. The list will include:

- Transport of oxygen to the cells
- Transport of nutrients
- Transport of white blood cells to combat infection
- Maintenance of vascular volume

2.1.2.K Given a list of locations in the body (i.e., liver, bone marrow), the student should be able to select the location of the production of red blood cells.

2.1.3.K Given a list of fluid volumes in liters and pints, the student should be able to select the volume of blood in the average male adult.

2.2.1.K Given a list of functions, the student should be able to select the one that best describes the function of:

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

- Plasma
- Red blood cells (RBC's)
- White blood cells (WBC's)
- Platelets

2.2.2.K Given four statements for each term, the student should be able to select the one that best defines each of the following terms:

- Hematocrit
- Hemoglobin

2.2.3.K Given a list of descriptions, the student should be able to select the one that best describes the clotting process.

2.3.1.K Given a list of statements, the student should be able to select the one that describes why blood typing is necessary (e.g., agglutination, transfusion reaction).

2.3.2.K Given the four blood types, A, B, AB, and O, the student should be able to identify the type labeled:

- Universal donor
- Universal recipient

2.3.3.K Given a list of indications, the student should be able to select the one(s) that indicates the need for blood transfusions.

2.3.4.K Given a list of definitions, the student should be able to select the one that best defines:

- Anemia
- Hemostasis

2.3.5.K Given a list of possible complications, the student should be able to select the one(s) that may occur when transfusing blood.

2.3.6.K Given a list of precautions, the student should be able to select those precautions that are appropriate when transfusing blood.

NOTES

NOTES

Instructor Activities

Assign the material referred to below during the class period immediately before beginning this unit:

- Chapter 3, Unit 2, of the *Text* and *Workbook*
- Knowledge objectives for this unit

Prepare a discussion session following the content outline below. The instructor should:

- Assign the reading before the class begins.
- Conduct a discussion based on student questions and the objectives provided.

Test the students after completing the first four units or the entire module. Use the objectives as a guide.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Materials

Knowledge objectives (optional)
Text

Content Outline

Introduction

- Review the knowledge objectives.
- Review the topics.

— Blood
  a. Function
  b. Characteristics
— Blood components
— Blood transfusion

NOTES

2.1. The blood

A. Function—transportation
   1. Respiratory—carries oxygen and carbon dioxide
   2. Nutritive—carries food substances in a very simple form.
   3. Excretory—carries waste products from cells to the organs of excretion
   4. Protective—carries defensive cells and antibodies
   5. Regulatory
      a. Carries hormones and other chemical substances that regulate organs
      b. Carries excess internal heat to lungs and body surface
      c. Maintains water balance (acid/base)

B. Characteristics
   1. Blood develops in bone marrow and lymph nodes.
   2. The color is normally bright red in systemic arteries because of saturation with oxygen.
   3. The color is brownish red or purple in systemic veins.
   4. The quantity is as follows:
      a. 5 to 7 percent of body weight
      b. 5 to 6 liters (9 to 11 pints)
   5. The distribution in a body at rest is as follows:
      a. 1/4—heart, lungs, and large vessels
      b. 1/4—liver
      c. 1/4—striated muscles
      d. 1/4—remainder of body

2.2. Blood components

A. Plasma
   1. Point out that 55 percent of the blood by volume is plasma
   2. Discuss composition—water, proteins, salts, organic substances, gases in solution
   3. Discuss function—fluid base

B. Formed elements
   1. RBC's—40–45 percent of blood by volume in adults, higher in infants.
   2. RBC's (erythrocytes)

a. Count—5,000,000 RBC's per cubic millimeter (mm^3)
b. Morphology
c. Function
   (1) Oxygen transport
   (2) Carbon dioxide transport
   (3) Blood pH maintenance
   (4) Blood viscosity maintenance
d. Hemoglobin
   (1) Definition—the molecule in the RBC that carries oxygen
   (2) Function—oxygen transport
e. Hematocrit
   (1) Definition
   (2) Normal range

3. WBC's (leukocytes)
   a. 3,000–11,000 per milliliter of blood (normal adult)
   b. Morphology
   c. Function
      (1) Engulfing of bacteria and foreign bodies
      (2) Isolation of infection
      (3) Antibody reaction
4. Platelets (thrombocytes)
   a. 150,000–400,000 per milliliter of blood (normal adult)
   b. Function—to assist in the clotting process
      (1) Point out that when the count falls below 50,000–80,000 per milliliter of blood, there is uncontrolled bleeding unless all else is normal
      (2) Point out that one function is to adhere to small leaks in capillaries and small vessels
   c. Clotting process
      (1) Components
      (2) Process description

2.3. Blood transfusions

A. Basis of blood grouping
   1. Blood groups (A, B, AB, O)
   2. Antigen in RBC's
   3. Antibodies in serum

NOTES

a. Number
b. Typing

4. U.S. population distribution by blood type

B. Blood preparations, derivatives, and substitutes
1. Whole blood
2. Packed red-blood cells
3. Plasma
4. Plasma substitutes
5. Crystalloids

C. Composition of IV fluids

D. Indications for transfusions
1. Severe blood loss
2. Burns
3. Shock
4. Body fluids

E. Hazards of transfusions
1. Incompatible blood (hemolytic reaction)
2. Pyrogenic reactions
3. Allergic reactions
4. Circulatory overload
5. Infection
6. Air embolism
7. Hepatitis

F. Precautions in transfusions of blood
1. Temperature control
2. Precautions before transfusions
3. Precautions during transfusions
4. Blood administration set—use of filters
5. Expected response to transfusions

NOTES

Summary

- Review the knowledge objectives.
- Review the topics:

— Blood
a. Function
b. Characteristics
— Blood components
— Blood transfusions

UNIT 3

DISORDERS OF HYDRATION

Knowledge Objectives

NOTES

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

3.1.1.K Given a list of definitions, the student should be able to select the one that best defines dehydration.

3.1.2.K Given a list of causes, the student should be able to select the one(s) that is (are) causes of dehydration.

3.1.3.K Given a list of signs and symptoms, the student should be able to select the one(s) that is (are) directly associated with dehydration.

3.1.4.K Given a situation indicating various combinations of patient conditions, vital signs, and identified problems, the student should be able to determine if the patient is dehydrated.

3.1.5.K Given a list of activities, the student should be able to select those that are appropriate treatments for patients with dehydration.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

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3.2.1.K Given a list of definitions, the student should be able to select the one that best defines overhydration.

3.2.2.K Given a list of causes, the student should be able to select the one(s) that is (are) causes of overhydration.

3.2.3.K Given a list of signs and symptoms, the student should be able to select the one(s) that is (are) directly associated with overhydration.

3.2.4.K Given a situation indicating various combinations of patient conditions, vital signs, and identified problems, the student should be able to determine if the patient is overhydrated.

3.2.5.K Given a list of activities, the student should be able to select those that are appropriate treatments for patients with overhydration.

Instructor Activities

Assign the material referred to below during the class period immediately before beginning this unit:

- Chapter 3, Unit 3, of the *Text* and *Workbook*
- Knowledge objectives for this unit

Prepare a lecture following the content outline on page III-19. Provide any required slides, overlays, charts, or diagrams.

Answer questions.

Test the students after completing the first four units or the entire module. Use the objectives as a guide.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Materials

Knowledge Objectives (optional)
Text and *Workbook*

Content Outline

NOTES

Introduction

- Review the knowledge objectives.
- Review the topics:

  — Dehydration
  — Overhydration

3.1. Dehydration

A. Review fluid losses and balance (Unit 1).
B. Define dehydration as excessive loss of body fluids and electrolytes (primarily Na^+).
C. Discuss the causes and mechanisms of fluid loss.
   1. Gastrointestinal losses—vomiting and diarrhea
   2. Increased insensible loss—fever, hyperventilation
   3. Increased diaphoresis
   4. Increased urinary losses
   5. Internal losses ("third space" losses)—peritonitis, pancreatitis
   6. Plasma loss—burns, drains, granulating wounds
D. Discuss the signs and symptoms.
   1. Loss of appetite
   2. Nausea and vomiting
   3. Weakness
   4. Fainting on standing up (postural syncope)
   5. Poor skin turgor—describe skin turgor and how to evaluate it
   6. Furrowed tongue
   7. Sunken eyes
   8. Weak and rapid pulse—will increase when the patient changes from a supine to an upright position
   9. Shock and coma are present in extreme cases
E. Discuss general treatment.
   1. Administration of fluid—a normal saline solution is usually used because it will stay in the vascular space temporarily, but long enough to be of real benefit (will be covered in Unit 5).
   2. Replacement of electrolytes—long-term therapy is required; this is not a field activity.

NOTES

3.2. Overhydration

A. Definition—excessive retention of body fluid, specifically water and salt (Na^+)

B. Causes
   1. Congestive heart failure
   2. Cirrhosis of the liver

C. Signs and symptoms
   1. Edema
      a. Generalized
      b. Pulmonary edema (discussed further in Module V)
   2. Rapid weight gain

D. General treatment
   1. Field treatment—do not administer fluids except to keep a route open for administering medications.
      a. Use microdrip administration (discussed further in Unit 5).
      b. Use fluid that will not stay in vascular space; that is, dextrose in water (discussed further in Unit 5).
   2. Clinical treatment—describe the purpose of:
      a. Salt restriction
      b. Diuretics
      c. Phlebotomy

Summary

- Review the knowledge objectives.
- Review the topics:
  - — Dehydration
  - — Overhydration

UNIT 4 emt-p

SHOCK

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to 80 percent* of the following:

4.1.1.K Given a list of requirements, the student should be able to select the one(s) that is (are) a requirement for adequate tissue perfusion with blood containing oxygen and nutrients.

4.1.2.K Given a list of definitions, the student should be able to select the one that best defines "shock."

4.1.3.K Given a list of definitions, the student should be able to select the one that best defines the cause of:

- Hypovolemic shock
- Cardiogenic shock
- Neurogenic shock
- Septic shock

4.1.4.K Given a list of examples, the student should be able to match the example with the type of shock with which it is associated (i.e., severe hemorrhage—hypovolemic shock).

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

4.2.1.K Given a list of activities, the student should be able to select those that are appropriate when evaluating a patient for shock.

4.3.1.K Given a list of signs and symptoms, the student should be able to identify those that are indicators of shock.

4.3.2.K Given a situation indicating various combinations of patient conditions, vital signs, and identified problems, the student should be able to determine if the patient is in shock.

4.4.1.K Given a list of activities, the student should be able to select the one(s) that is (are) appropriate for treating a patient with suspected shock.

4.4.2.K Given a list of statements, the student should be able to select the one that best describes the purpose for each of the activities involved in treating shock.

4.4.3.K Given a list of reasons, the student should be able to select the one that best describes the reason for keeping shock patient in a supine position.

4.4.4.K Given a list of statements, the student should select the one that best describes why fluids are administered in all types of shock.

Instructor Activities

Assign the material referred to below during the class period immediately before beginning the unit:

- Chapter 3, Unit 4, of the *Text* and *Workbook*
- Knowledge objectives for this unit

Prepare a lecture and discussion session following the content outline on page III-23. Provide any slides, overlays, charts, or diagrams. The following activities are suggested:

- Section 4.1 of the content outline can be presented in a lecture.

NOTES

- Sections 4.2, 4.3, and 4.4 of the content outline can be presented by asking the students as a group to develop a list of (1) patient assessment activities, (2) signs and symptoms, and (3) treatment. The instructor should complete the listings and discuss the purpose for each activity with the students.
- Section 4.3B is included to provide the student with insight into clinical activities dealing with patients in shock. Time has been allotted for this segment, but the level of emphasis should be determined by the instructor.

Answer questions.

Test the students after completing this unit or the entire module. Use the objectives as a guide. Advise each student of his progress and suggest remedial instruction, if neccessary.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

Military Anti-Shock Trousers (MAST)

Materials

Knowledge objectives (optional)
Written examination
Answer sheets and pencils
Text and *Workbook*

Content Outline

Introduction

- Review the knowledge objectives.
- Review topics:

  — Shock—types
  — Patient assessment for shock

NOTES

— Signs and symptoms of shock
— General treatment of shock

NOTES

4.1. Shock—causes and types

A. Requirements for normal tissue perfusion
   1. Adequate fluid volume—blood and plasma
   2. Functioning pump—the heart
   3. Intact vascular system—capable of reflex adjustments in response to changes in cardiac output and fluid volume

B. Types
   1. Definition—inadequate tissue perfusion; tissues are not receiving an adequate blood flow to supply oxygen and nutrients
   2. Inadequate fluid volume (hypovolemic shock)
      a. Point out that it is a loss of circulatory body fluid, for whatever reason.
      b. Give examples.
         (1) Hemorrhage—external or internal
         (2) Burns
         (3) Third space loss—peritonitis, intestinal obstruction
         (4) Massive diarrhea
         (5) Severe vomiting
         (6) Polyuria
         (7) Diaphoresis
   3. Pump failure (cardiogenic shock)
      a. Point out that it is decreased cardiac output because of "pump" damage or dysfunction.
      b. Give examples.
         (1) Myocardial infarction
         (2) Arrhythmias
         (3) Cardiac tamponade
         (4) Pulmonary embolism
         (5) Severe acidosis
         (6) Valve damage
   4. Decreased vascular resistance (neurogenic shock)
      a. Point out that it is a decrease in peripheral resistance.

b. Point out that the loss of sympathetic control of vessels leads to marked vasodilation.
c. Point out that effective circulatory volume is lost into dilated vessels.
d. Give examples.
(1) Spinal trauma, spinal anesthesia
(2) Some diabetics
(3) Cirrhosis
(4) May be a component of septic shock

5. Combined etiologies—the above types can be found individually or in any combination.

C. Pathophysiology of shock
1. Review pathophysiology of shock as presented in the *Text.*
2. Emphasize the cyclic nature of shock with respect to increasing shock state.

4.2. Patient assessment for shock

A. Evaluate the patient and environment for overt indications of shock.
1. Previous history—that is, prior history of heart attack; severe illness with diarrhea
2. Mechanism of injury—indications of trauma

B. Evaluate the patient especially concerning:
1. State of consciousness
2. Airway
3. Respirations
4. Pulse—rate and quality
5. Skin color and texture
6. Blood pressure

4.3. Clinical signs and symptoms—discuss signs, symptoms, and causes.

A. Vital signs
1. Pulse—weak, rapid, thready
2. Blood pressure—abnormally decreased

NOTE: Emphasize that it is not necessary for blood pressure to decrease for the patient to be in shock.

NOTES

3. Respiration—shallow, labored, rapid, irregular
4. Temperature—abnormal

B. Symptoms
1. Restlessness, confusion
2. Anxiety
3. Thirst
4. Nausea and vomiting
5. Dizziness

C. Signs
1. Skin—cold, clammy
2. Diaphoresis
3. Cyanosis
4. Fainting
5. Decreased urinary output

4.4. General treatment

A. General measures for any patient in the field—discuss activities and purposes.
1. Establish or maintain an airway.
2. Stop severe hemorrhage, if present.
3. Administer oxygen (skill of oxygen administration is covered in Module V).
4. Maintain the patient in a supine position with the lower extremities slightly elevated.
NOTE: Avoid the Trendelenburg position, if possible.
5. Apply MAST.
a. Purpose
(1) Control external hemorrhage
(2) Autotransfusion
b. Further description is in Unit 5
6. Insert a large-bore intravenous catheter (14–16 gage) for a rapid infusion.
a. The purpose is to replace lost body fluids.
b. A further description is in Unit 5
7. Draw blood samples.
a. The purpose is to type and cross-match for whole blood.
b. A further description is in Unit 5.

B. General treatment in a clinical setting (present for understanding only)

NOTES

1. Insert a central venous pressure line; the purpose is to monitor changes in venous pressure near the right heart.
2. Insert urinary catheter.
   a. The purpose is to monitor urinary output.
   b. Urine output is a good indication of renal perfusion.
   c. Module X presents it as an optional skill.
3. Administer drugs—actions of drugs covered in Module IV. (Any drugs mentioned here should be reviewed after presentation of that module.)
   a. Norepinephrine (Levophed) or dopamine
      (1) Causes constriction of the blood vessels
      (2) Used especially in cases of neurogenic shock
      (3) Also used in other forms of shock—does not solve the problem, only compensates by vasoconstriction
   b. Antibiotics
      (1) Used in septic shock
      (2) Used in other forms of shock to reduce possibility of secondary infection
   c. Steroids—reasons for use
4. Monitor
   a. Arterial blood gases
   b. Electrolytes, blood urea nitrogen, hematocrit
   c. Central venous pressure
   d. Urine output
   e. Weight
   f. Serum lactate/pyruvate
   g. Electrocardiogram, pulse, blood pressure, temperature, sensorium

NOTES

Summary

- Review the knowledge objectives.
- Review the topics:
  - — Shock—types
  - — Patient assessment for shock
  - — Signs and symptoms of shock
  - — General treatment for shock
- Ask for questions.

UNIT 5 emt-p

TECHNIQUES OF MANAGEMENT

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

5.1.1.K Given a list of five statements by the instructor, the student should select two that are purposes of an intravenous infusion.

5.1.2.K Given a list of a minimum of 15 items that might normally be carried in an emergency care jump kit, the student should select seven that are essential to the initiation of an infusion. To complete the objective, the student must select and explain six of the seven items.

5.1.3.K Given a specific IV solution and a list of five possible components of that solution by the instructor, the student should select those components that are in the solution. To complete the objective, the student must select at least two components for each IV solution. The student will be given a minimum of three solutions to evaluate.

5.1.4.K Given a minimum of five situations indicating various combinations of patient conditions, vital signs, and identified problems, the student should recall the appropriate IV solution to be used and the reason for its use.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

NOTES

5.1.5.K Given an IV solution bottle, the student should demonstrate the volume of content in milliliters and liters. The student must be accurate on two attempts to within 5 percent of the total bottle capacity to complete the objective.

5.1.6.K Given a diagram of a standard administration set, or an actual administration set, and a list of the parts of that set, the student should identify and locate each part of the administration set. The student will successfully complete the objective by identifying and locating five or six parts.

5.1.7.K The student should be able to compare a standard and pediatric administration set with respect to the drops per minute and explain the effect of viscosity of the solution upon that rate.

5.1.8.K Given a diagram of an intravenous needle (butterfly), or the actual needle, and a list of the parts of the needle, the student should identify and locate each of the parts. The student will successfully complete the objective by identifying and locating four parts.

5.1.9.K Given a diagram of an over-the-needle catheter device (angiocath), or the actual device, the student should identify and locate each of the parts on a list provided. The student will successfully complete the objective by identifying and locating four parts.

5.1.10.K* Given a diagram of a through-the-needle device (intracath), or the actual device, the student should identify and locate each of the parts on a list provided. The student will successfully complete the objective by identifying five parts.

5.1.11.K* The student should be able to compare the over-the-needle device with an intracatheter. The student will successfully complete the objective by stating two differences.

*Indicates optional skill.

NOTES

5.1.12.K Given a list of a minimum of seven areas of the body, the student should indicate whether it is an appropriate site for a venipuncture and justify his answer with at least one reason.

5.1.13.K Given a diagram of the superficial veins of the forearm and a diagram of the superficial veins of the dorsal aspect of the hand, the student should identify and locate on the diagram six of eight veins. A list of veins to be located will be provided.

5.1.14.K Given a list of activities in random order of the steps in starting an IV, the student should be able to place the activities in the appropriate order.

5.1.15.K Given a list of three statements that compare the gage (size) of the needle to the lumen of the vein, the student should indicate whether the vein should be approached bevel up or bevel down.

5.1.16.K Given a list of statements, the student should be able to select the one that best describes the purpose of the tourniquet.

5.1.17.K Given the amount of fluid to be administered during a specified time and the type of administration set used, the student should be able to calculate the flow rate (drops per minute) to within 10 percent of the correct flow rate.

5.1.18.K Given five situations that describe the patient's condition and vital signs, the student should select those situations that indicate that a possible air embolism has entered the patient. Of the five situations, no more than three will be situations depicting an air embolism in the patient, and the student must correctly respond 100 percent of the time.

5.1.19.K Given a situation that indicates that a patient is suffering from an air embolism in his system, the student should recall the proper position in which the patient must be placed to minimize the effect of the embolism. The student must respond correctly to complete the objective.

NOTES

5.1.20.K Given a list of reasons, the student should be able to select the one that best describes why the needle should not be reinserted in the catheter once removed.

5.1.21.K Given a situation that describes a patient having a severed catheter in the system, the student should recall the proper procedure for dealing with the situation and the dangers involved. To complete the objective, the student must indicate the proper procedure and at least one danger involved in a severed catheter.

5.1.22.K The student should be able to describe the effect IV fluid temperature has on the vessels upon entering the body.

5.1.23.K Given a list of statements, the student should be able to select the one that best describes the procedure for treating infiltration.

5.1.24.K Given a list of statements, the student should be able to select the one that best describes the purpose of drawing blood samples before administering IV fluids or drugs.

5.1.25.K Given four statements for each term, the student should be able to select the one that best defines each of the following terms:

- Aseptic
- Bevel
- Catheter
- Dorsal
- Edema
- Embolism
- Hematoma
- Hypertonic
- Hypotonic
- Infiltration
- Isotonic
- Liter
- Lumen
- Necrosis
- Peripheral
- Piggyback
- Thrombophlebitis
- Thrombus
- Tourniquet
- Vein
- Venipuncture

5.2.1.K Given a list of statements, the student should be able to select the one that best describes the indications for the use of the MAST.

5.2.2.K Given a list of statements, the student should be able to select the one that best describes the contraindications for the use of the MAST.

NOTES

5.2.3.K Given a list of situations indicating various combinations of patient conditions, vital signs, and identified problems, the student should be able to select the situations in which the MAST should be applied.

5.2.4.K Given a list of statements, the student should be able to select the one that best describes the effects of the application of the MAST.

5.2.5.K Given a list of statements, the student should be able to select one that best describes when the MAST should be deflated.

5.2.6.K Given a list of statements, the student should be able to select the one that best describes the procedure for removing the MAST.

5.3.1.K* Given a diagram of the veins and arteries in the neck and upper thorax, the student should be able to identify the subclavian, external jugular, and internal jugular veins.

5.3.2.K* Given a list of statements, the student should be able to select the statement(s) that best describes the advantages of jugular or subclavian vein catheterization over initiation of a peripheral IV.

5.3.3.K* Given a list of statements, the student should be able to select the one(s) that best describes possible complications when performing jugular or subclavian vein catheterization.

5.3.4.K* Given a description of a patient who has just had a subclavian catheterization, including the patient's condition and vital signs, the student should be able to state whether the following complications have occurred:

- Air embolism
- Puncture of the lung

5.3.5.K* Given a list of procedures, the student should be able to select the one that best describes the procedure for performing:

*Indicates optional skill.

- Internal jugular catheterization
- External jugular catheterization
- Subclavian vein catheterization

NOTES

Skill Objectives

After completing this module, the student should be able to correctly perform each of the skill objectives. "Correctly" will be defined by the instructor. Skill evaluation sheets are included in the module.

5.1.1.S Given the following equipment—an 18-gage winged-needle device, an administration set, intravenous (IV) fluid, iodine wipes, a tourniquet, sterile dressing, a padded arm board, and adhesive tape—the student should be able to demonstrate on a fellow student the procedure for initiating an IV using a winged-needle device. The infusion will be considered successful if it is running at a flow rate within three drops per minute(gtt/min) of the stipulated flow rate, infiltration is not present, and the venipuncture was completed within 3 minutes.

5.1.2.S Given the following equipment—an 18-gage over-the-needle catheter device, an administration set, IV fluid, iodine wipes, a tourniquet, sterile dressing, a padded arm board, and adhesive tape—the student should be able to demonstrate on a practice arm the procedure for initiating an IV using an over-the-needle catheter device. The infusion will be considered successful if it is running at a flow rate within 3 gtt/min of the stipulated flow rate, infiltration is not present, and the venipuncture was completed within 3 minutes.

5.1.3.S* Given the following equipment—an 18-gage through-the-needle catheter device, an administration set, IV fluid, iodine wipes, a tourniquet, sterile dressing, a padded arm board, and adhesive tape—the student should be able to demonstrate on a practice arm the procedure for initiating an IV using a through-the-needle catheter device. The

*Indicates optional skill.

infusion will be considered successful if it is running at a rate within 3 gtt/min of the stipulated flow rate, infiltration is not present, and the venipuncture was completed within 3 minutes.

NOTES

5.1.4.S Given a properly functioning infusion on a practice arm or fellow student during a practical exercise, the student should be able to demonstrate the technique of stopping an infusion and caring for the injection site.

5.1.5.S Given a minimum of three situations presented by the instructor during a practical exercise in which the IV infusion is not running on a practice arm, the student should identify the problem and correct it. The student will encounter problems included in the following list:

- Flow clamp closed
- Height of the IV too great
- Needle not patent
- Tubing kinked or pinched
- Air vent not patent
- Tourniquet still in place
- Local infiltration

the student should correctly identify the problems and correct them two out of three times. Each situation may involve more than one, but not more than two problems.

5.1.6.S Given a properly functioning infusion on a practice arm during a practical exercise, the student should correctly demonstrate the technique for removal of an air bubble from the administration set. The demonstration will be considered successful if the bubble is entirely removed in two consecutive attempts.

5.1.7.S Given an over-the-needle device properly initiated in a practice arm, a 25-cc syringe, a three-way stopclock, and three rubber-topped sample collecting tubes, the student should be able to demonstrate the procedure for collecting blood samples.

NOTES

5.2.1.S Given the Military Anti-Shock Trousers (MAST), a patient or manikin in the supine position, and a fellow student as an assistant, the student should be able to demonstrate the procedure for the application of the MAST. Also, the student should be able to demonstrate the procedure for deflating the MAST. In order to complete this objective, the student must deflate the MAST in the proper sequence and assess pulse and blood pressure at least twice after each segment is deflated before deflating the next segment. (Caution—if a fellow student is used as the patient, be sure he empties his bladder before the demonstration.)

5.3.1.* Given the following equipment: an 18-gage through-the-needle catheter device, an administration set, IV fluid, iodine wipes, a tourniquet, and sterile dressing, the student should be able to demonstrate on a live patient the procedure for internal jugular, external jugular, or subclavian vein catheterization. The infusion will be considered successful if it is running at a flow rate within 3 gtt/min of the stipulated flow rate and infiltration is not present.

Instructor Activities

Assign the material referred to below during the class period immediately before beginning the unit:

- Chapter 3, Unit 5, of the *Text*
- Knowledge and skill objectives for this unit

Prepare a lecture following the content outline on page III-38. Provide any slides, overlays, charts, or diagrams. During the lecture, provide a sample of the equipment and materials presented.

Develop and assign sample problems for the calculation of flow rates as a homework assignment.

Prepare a session to include the following demonstrations:

5.1.1.S Technique of Venipuncture Using a Winged Infusion Needle (butterfly)

5.1.2.S Technique of Venipuncture Using an Over-the-Needle Catheter Device (angiocath)

*Indicates optional skill.

5.1.3.S* Technique of Venipuncture Using a Catheter Through-the-Needle Device
5.1.4.S Procedure for Terminating an IV
5.1.5.S Procedure for Evaluating an IV that Is Not Flowing Properly
5.1.6.S Procedure for the Removal of an Air Embolism from the Administration Set Tubing
5.1.7.S Drawing Blood Samples
5.2.1.S Application of the Miltary Anti-Shock Trousers

When discussing jugular and subclavian vein catheterizations,* include the following:

- Use a diagram or illustration to show the relative position of the veins and other anatomical features.
- Discuss in detail the procedure for each of the catheterizations.
- Have the students practice locating the veins on each other.

Monitor the students while they practice the demonstrated skills. Answer questions and correct any mistakes you observe.

Test the students after completing this unit or the module. Each student will also be required to take a written examination. Advise each student of his progress and suggest remedial instruction, if appropriate.

Equipment and Materials

Equipment—Educational

IV practice arm (one for every five students)
Chalkboard and chalk

Equipment—Medical

Winged infusion needles (two per student)
Catheter-over-needle device (two per student)
Catheter-through-needle device (two per student)
Administration sets (regular) (one per student)
Administration sets (pediatric-minidrip) (one per student)
IV solutions (two per student)

*Indicates optional skill.

NOTES

Alcohol swabs (one box)
Iodine swabs (one box)
Padded arm boards (5)
Rubber tubing tourniquets (10)
Blood sample vacutubes (20)
Disposable syringes (20)
18-gage needles (10)
Adhesive tape (three rolls)
Sterile dressings
Antiseptic ointment

Materials (one per student)

Knowledge and skill objectives (optional)
Written examination
Answer sheets and pencils
Handout—homework assignment on calculating flow rates
Text

Content Outline

Introduction

- Review the skill and knowledge objectives.
- Review the topics:

— Peripheral IV insertion
  a. Equipment
  b. Anatomy and physiology
  c. Technique
— MAST

5.1. Peripheral IV insertion

A. Purpose
  1. Provides a lifeline for the administration of drugs.
  2. Provides a route for the replacement of fluid, electrolyte, or nutrient losses.
B. Indications for venipuncture
  1. Necessity for fluid replacement (hypovolemic shock, burns)

NOTES

2. Necessity for lifeline for administration of drugs (i.e., myocardial infarction)

C. IV equipment

1. Commercially prepared solutions
   a. Show the students glass bottle containers.
      (1) Closed vacuum system containers with filters
      (2) Airway in bottle systems
   b. Show the students plastic bag containers.
   c. Describe the components of each.
2. Types of fluids (review from Unit 1)
   a. Dextrose solutions (5-percent dextrose in water = D5W)—isotonic solutions of dextrose are used to keep a line open in patients who do not need massive volume replacement (e.g., heart failure).
   b. Sodium chloride solutions (0.9-percent sodium chloride in water = normal saline = N/S)—isotonic solutions of sodium chloride solutions are used to restore losses of water and sodium chloride or, transiently, to replace lost vascular volume (crystalloid).
   c. Lactated solutions (Ringer's lactate)—source of water, electrolytes, and calories; used in some centers for severe trauma cases, fractures, and head injuries (crystalloid).
   d. Plasma expanders (plasmanate)—source of fluids, electrolytes, and proteins (colloid); used in cases of volume depletion, that is, severe hemorrhage.
3. IV administration sets
   a. Show the students a standard administration set.
      (1) Components
      (2) Flow rate (gtt/ml)
      (3) Indications for use
   b. Show the students a pediatric administration set.
      (1) Components
      (2) Flow rate (gtt/ml)
      (3) Indications for use
   c. Show the students special administration sets.
      (1) Series-hookup sets
      (2) Controlled-volume sets
      (3) Positive-pressure sets

NOTES

(4) Blood-transfusion sets

d. Describe the components of each.

4. Needles and catheters

a. Describe the types, components, and gages.

(1) Straight needle (butterfly)

(2) Catheter-over-needle device (angiocath)—preferred for field use

(3) Catheter-through-needle device (intracath)

(4) Desired rapidity of infusion

b. Discuss the indications for needle selection and needle gage selection.

(1) Purpose of an IV

(2) Patient (adult vs. infant)

(3) Site of venipuncture

c. Show the students each type of needle and describe the components of each.

5. Tourniquet

a. Purpose—obstructs only the venous flow

b. Types—show and describe the use of each:

(1) Soft rubber tubing

(2) Blood pressure cuff

(3) Commercial tourniquet

6. Other supplies—show and describe the use of each:

a. Arm board

b. Antiseptic cleaning solution

c. Sterile dressing (4 × 4 gauze)

d. Adhesive tape

e. Scissors

f. Paper towels

g. Pen and label for container identification

D. Anatomy and physiology applied to IV therapy

1. Anatomical description of skin and fascia

a. Epidermis

b. Dermis

c. Superficial fascia

2. Anatomical location of veins—show illustrations of the veins

a. Locate veins in the upper extremities—forearm.

(1) Cephalic

(2) Accessory cephalic

(3) Basilic

NOTES

(4) Median cubital
(5) Median cephalic

b. Locate veins in the upper extremities—dorsal aspect of the hand.
(1) Digital veins
(2) Metacarpal veins
(3) Dorsal venous arch

c. Locate veins in the lower extremities*—venous plexus.

d. Locate veins in the upper body.
(1) Subclavian
(2) External jugular
(3) Internal jugular

e. Have students examine each other to locate the veins relative to other structures in the area—arteries, nerves, lung, etc.

E. Venipuncture technique—demonstrate on a student
1. Patient preparation
a. Relax the patient.
b. Explain the procedure and purpose.
2. Equipment preparation
a. Select the fluid ordered by the physician.
b. Check the solution container for cracks, seal leakage, contamination, cloudiness of solution, and manufacturer's expiration date.
c. Gather all equipment needed and cut the amount of adhesive tape necessary.
d. Select the tubing, attach, and clear the air from it.
3. Site selection
a. Factors in determining the site
(1) Suitable location—the areas not to be considered include:
(a) Areas of joint inflexion
(b) Areas with aberrant arteries prevalent
(c) Veins near injured or affected areas
(d) Veins of the lower extremities
(2) Conditions of the veins
(a) Cord line
(b) Rolling

NOTES

*Not recommended for field use by emergency medical technicians.

(3) Purpose of infusion—large vein and large-bore IV are necessary for rapid infusion
(4) Duration of therapy—start the IV as distal as possible

b. Procedure
(1) Let the patient's arm hang down, apply a tourniquet 2" above the site selected for use—check that the pulse is still present and have the patient clench and unclench his fist.
(2) Inspect the hand and forearm for a vein with the following characteristics:
(a) Fairly straight
(b) On a flat surface
(c) Dilates well
(d) Springy when palpated
(e) Well fixed, not rolling

4. Insertion
a. Prepare the injection site by cleaning the area in a circular motion beginning at the insertion point—aseptic technique.
b. Select the type and gage of the needle.
c. Perform venipuncture.

5. Care of injection site and catheter—two methods:
(1) H method used for butterflies
(2) Chevorn used for other type needles
a. Taping of the catheter and tubing
b. Dressing of the injection site
c. Demonstration 5.1.1.S, 5.1.2.S, or 5.1.3.S*

6. Termination of an IV
a. Removal of the catheter
b. Pressure over the site
c. Dressing the injection site

7. Calculation of the flow rate
a. Point out that it is usually indicated by the physician's orders.
b. Calculate the drops per minute.

Given: Volume to be induced
Time period
Administration set (gtt/ml)

NOTES

*Indicates optional skill.

$$\text{gtt/min} = \frac{\text{volume to be induced}}{\text{time period}}$$

$$= \text{administration set (gtt/ml)}$$

$$\text{gtt/min} = \frac{\text{ml}}{\text{min}} \times \left| \frac{\text{gtt}}{\text{ml}} \right.$$

c. Give the students sample problems as a homework assignment.

8. Demonstration 5.1.4.S
9. Practice Session 1

F. Complications—describe the indications and management of each

1. Sepsis
   a. Contamination of equipment and fluids
   b. Lapse of aseptic technique
2. Local infiltration
3. Circulatory overload
4. Thrombophlebitis
5. Pyrogenic reactions
6. IV malfunction—describe the procedure for evaluating a nonfunctioning IV
   a. Flow clamp is closed.
   b. Height of the the IV is too low.
   c. Needle is not patent (clot formation).
   d. Tubing is kinked or pinched.
   e. Air vent is not patent.
7. Air embolism
   a. Cause
   b. Signs of air embolism
8. Nerve damage
9. Catheter emboli—demonstrate how the catheter is severed in the vein
10. Arterial puncture
11. Demonstrations 5.1.5.S and 5.1.6.S

G. Additional factors

1. Piggybacking IV solutions
   a. Procedure
   b. Complications
2. Administering medications (review)
3. Drawing blood samples
   a. Purpose

NOTES

(1) Type and cross-match blood
(2) Blood analysis (complete blood count, enzymes), glucose, electrolytes

b. Coding of the sample tube tops
c. Procedure
d. Demonstration 5.1.7.S

5.2. Military Anti-Shock Trousers

A. Description
1. Describe it as a double-layered, inflatable nylon garment enclosing the body from the lower rib cage margin to the ankles.
2. Indicate that each extremity is separately enclosed.
3. Point out that it is capable of sustaining an internal air pressure up to around 100 mm Hg. pressure.

B. Purpose
1. Puts direct pressure on hemorrhaging internal organs
2. Autotransfusion of blood—prevents blood return to the lower part of body
3. Splinting of pelvic and lower extremity fractures

C. Indications for use
1. Internal hemorrhage
2. Trauma below the costal margins
3. Severe fluid loss
4. Severe shock from any cause

D. Problems of use
1. Visual and palpatory examinations cannot be done.
2. They may restrict the lung expansibility.
3. Prolonged use may cause severe acidosis and permanent impairment of the lower extremities.
4. They are usually contraindicated in congestive heart failure, pulmonary edema isolated intracranial trauma, and hemorrhage above diaphragm.
5. Abdominal pressure may trigger urination, defecation, or emesis.

E. Procedure
1. Application of MAST
2. Removal of MAST

F. Demonstration 5.2.1.S
G. Practice Session 2

NOTES

NOTES

5.3.* External jugular, internal jugular, and subclavian IV insertion

A. Anatomy
   1. Discuss the relative locations of:
      a. External jugular
      b. Internal jugular
      c. Subclavian vein
   2. Discuss the location of veins with respect to vital organs; that is, lungs and critical arteries like the carotid.

B. Purpose
   1. Point out that it has the same advantages as a peripheral IV.
   2. Point out that it is accessible even in cases of peripheral vascular collapse.

C. Complications
   1. Inadvertent introduction of an air embolism
   2. Puncture of a lung
   3. Subclavian artery puncture
   4. Pneumothorax
   5. Puncture of a heart chamber
   6. Arrhythmia from catheter initiation
   7. Cardiac tamponade
   8. Catheter breakage with embolization, usually to pulmonary artery

D. Procedure
   1. Explain that it is the same as procedure for a peripheral IV, with the exception of catheter insertion.
   2. Point out that a through-the-needle catheter is usually easier to use.
   3. Discuss external jugular vein cannulation—steps:
      a. Place the patient in a supine, head-down position to fill the jugular vein; turn the patient's head to the side opposite the intended venipuncture site.
      b. Cleanse and anesthetize the skin.
      c. Align the cannula in the direction of the vein, with the point aimed toward the shoulder on the side of the venipuncture.

*Indicates optional skill.

d. Make your puncture midway between the angle of the jaw and the midclavicular line; stabilize the vein lightly with one finger just above the clavicle.
e. From there, proceed as described for cannulation of a peripheral vein. Be careful not to let air enter the catheter once it is inserted. Quickly attach your infusion set as soon as blood return is established.
f. Tape the line securely, but do *not* put circumferential dressings around the neck.

4. Discuss internal jugular venipuncture (anterior approach).
   a. Place the patient in a supine, head-down position to fill the jugular vein; turn the patient's head to the side opposite the intended venipuncture site.
   b. Cleanse and anesthetize the skin.
   c. Place the index and middle fingers about 3 centimeters lateral to the midsternal line and retract the carotid artery medially away from the anterior border of the sternomastoid muscle.
   d. Introduce the needle at the midpoint of this anterior border, halfway between the clavicle and the angle of the jaw.
   e. Direct the needle toward the nipple at a 30°-45° angle with the frontal plane.
   f. Proceed as for a peripheral IV.
5. Discuss subclavian vein catheterization.
   a. Place the patient in a supine, head-down position to fill the jugular vein; turn the patient's head to the side opposite the intended venipuncture site.
   b. Cleanse and anesthetize the skin.
   c. Insert the needle 1 centimeter below the junction of the medial and middle thirds of the clavicle.
   d. Hold the syringe and needle parallel to the back of the patient.
   e. Direct the needle toward the opposite shoulder. Establish a point of reference by firmly pressing the fingertip into the suprasternal notch and directing the course of the needle slightly behind the fingertip.
   f. When you have entered the lumen of the subclavian vein, route the needle so that it faces more toward

NOTES

the feet, since the catheter must make a turn into the innominate vein. Extreme caution should be taken to avoid laceration to the artery and lung.

NOTES

Demonstration 5.1.1.S: Venipuncture Using a Winged Infusion Needle

NOTES

Equipment

Winged infusion needle
Administration set
IV solution
Tourniquet
Alcohol and iodine swabs
Antiseptic ointment
Sterile dressing
Adhesive tape
Padded arm board

Procedure

Demonstrate the procedure step by step using a student as a patient.

Emphasize each step, including critical errors that can be made.

Be sure each student can see clearly.

Steps

1. Inform the patient of the procedure.
2. Equipment preparation
   a. Select the fluid ordered by the physician. Be sure to check the container for signs of damage and the fluid for signs of contamination, that is, cloudiness.
   b. Gather all the necessary equipment.
   c. Cut the amount of adhesive tape needed.
   d. Select an administration set, attach to the IV container, and bleed the air from the tubing. Emphasize:
      (1) Aseptic handling of the container and administration set
      (2) Filling the drip chamber and bleeding the line
   e. Select a needle, attach it to the tubing, and bleed the air from the tubing and needle. Emphasize:
      (1) Aseptic handling of the needle
      (2) Bleeding air from the needle

3. Site selection
   a. Apply the tourniquet.
   b. Inspect the hand and forearm for a suitable vein. Emphasize the factors in determining a site.
      (1) Suitable location
      (2) Condition of the vein
      (3) Purpose of the infusion
      (4) Duration of therapy
4. Insertion
   a. Prepare the injection site—emphasize:
      (1) Aseptic technique
      (2) Technique of preparing the site in an expanding circular motion
   b. Describe the technique.
      (1) Stabilize the vein using your thumb.
      (2) Puncture the skin slightly to the side of the vein—emphasize level position. If using winged needles, puncture on top of vein at 45° angle and level off.
      (3) Relocate the vein and enter the vein lumen—backflow of blood indicates the vein has been entered.
      (4) Feed the needle into the vein.
      (5) Remove the tourniquet.
      (6) Adjust the flow.
      (7) Observe for infiltration.
5. Care of the site and securing the IV
   a. Tape the needle in position over the wings.
   b. Cover with sterile dressing.
   c. Loop the tubing and secure it to the arm with tape—emphasize:
      (1) Problems with securing the tape too tightly
      (2) The need to avoid circumferential taping
      (3) That the injection site should be readily available
   d. Splint the arm with a padded arm board
   e. Label the IV and indicate:
      (1) Time and date
      (2) Type and gage of the needle
   f. Monitor the IV. Emphasize the monitoring of:
      (1) Patient's blood pressure
      (2) Fluid level in the IV fluid container
      (3) Fluid level in the drip chamber

NOTES

(4) Infiltration
(5) Development of an air embolism in the administration set

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 5.1.2.S: Venipuncture Using Over-the-Needle Catheter Device

NOTES

Equipment

Catheter-over-needle device
Administration set
IV solution
Tourniquet
Alcohol and iodine swabs
Antiseptic ointment
Sterile dressing
Adhesive tape
Padded arm board

Procedure

Demonstrate the procedure for starting an IV using a catheter-over-needle device on a practice arm.

Emphasize each step, including critical errors that can be made.

Be sure each student can see clearly.

Steps

1. Inform the patient of the procedure.
2. Equipment preparation
   a. Select the fluid ordered by the physician. Be sure to check the container for signs of damage and the fluid for signs of contamination, that is, cloudiness.
   b. Gather all the necessary equipment.
   c. Cut the amount of adhesive tape needed.
   d. Select the administration set, attach it to the IV container, and bleed the air from the tubing. Emphasize:
      (1) Aseptic handling of the container and administration set
      (2) Filling the drip chamber and bleeding the line
3. Site selection
   a. Apply the tourniquet.
   b. Inspect the hand and forearm for a suitable vein. Emphasize factors in determining a site:
      (1) Suitable location

(2) Condition of the vein
(3) Purpose of infusion
(4) Duration of therapy

4. Insertion
   a. Prepare the injection site. Emphasize:
      (1) Aseptic technique
      (2) Technique of preparing the site in an expanding circular motion
   b. Demonstrate the technique.
      (1) Select the proper gage needle.
      (2) Stabilize the vein using your thumb.
      (3) Puncture the skin to the side of the vein—emphasize a bevel position.
      (4) Enter the vein lumen—a backflow of blood indicates the vein has been entered.
      (5) Hold the needle in place, slide the catheter hub down the needle, and remove the needle—emphasize that the catheter should not be slid back up the needle because this may cause catheter breakage.
      (6) Attach the catheter to the administration set tubing—emphasize aseptic technique.
      (7) Remove the tourniquet.
      (8) Adjust the flow.
      (9) Observe for infiltration.
5. Care of the site and securing the IV
   a. Tape the catheter and administration set adapter in place; tape them independently.
   b. Cover with sterile dressing.
   c. Loop the tubing and secure it to the arm with tape. Emphasize:
      (1) Problems with securing the tape too tightly
      (2) The need to avoid circumferential taping
      (3) That the injection site should be readily available
   d. Splint the arm with a padded arm board.
   e. Label the tape and indicate:
      (1) Time and date
      (2) Type and gage of needle
   f. Monitor the IV. Emphasize the monitoring of:
      (1) Patient's blood pressure
      (2) Fluid level in the IV fluid container
      (3) Fluid level in the drip chamber

NOTES

(4) Infiltration
(5) Development of an air embolism in the administration set
(6) A severed catheter

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 5.1.3.S*: Venipuncture Using a Through-the-Needle Catheter Device

NOTES

Equipment

Catheter-through-needle device
Administration set
IV solution
Tourniquet
Alcohol and iodine swabs
Antiseptic ointment
Sterile dressing
Adhesive tape
Padded arm board

Procedure

Demonstrate the procedure for initiating an IV using a catheter-through-needle device on a practice arm.

Emphasize each step, including critical errors that can be made.

Be sure each student can see clearly.

Steps

1. Inform the patient of the procedure.
2. Equipment preparation
   a. Select the fluid ordered by the physician. Be sure to check the container for signs of damage and the fluid for signs of contamination, that is, cloudiness.
   b. Gather all the necessary equipment.
   c. Cut the amount of adhesive tape needed.
   d. Select the administration set, attach it to the IV container, and bleed the air from the tubing. Emphasize:
      (1) Aseptic handling of the container and administration set
      (2) Filling the drip chamber and bleeding the line
3. Site selection
   a. Apply the tourniquet.
   b. Inspect the hand and forearm for a suitable vein. Emphasize factors in determining the site:

*Indicates optional skill.

(1) Suitable location
(2) Condition of the vein
(3) Purpose of the infusion
(4) Duration of therapy

4. Insertion
   a. Prepare the injection site—emphasize:
      (1) Aseptic technique
      (2) Technique of preparing the site in an expanding circular motion
   b. Demonstrate the technique.
      (1) Select the proper gage needle.
      (2) Stabilize the vein using your thumb.
      (3) Puncture the skin to the side of the vein—emphasize the bevel position.
      (4) Enter the vein lumen—a backflow of blood indicates the vein has been entered.
      (5) Hold the needle in place and thread the catheter through the lumen of the needle into the vein—emphasize:
         (a) The length of the catheter to be introduced
         (b) The catheter should not be slid back through the needle because this could cut the catheter and cause embolization.
      (6) Apply pressure on the vein to secure the catheter, and withdraw the needle.
      (7) Place a protective clip over the needle at its junction with the catheter.
      (8) Apply dressing over the puncture site.
      (9) Attach the catheter to the administration set—emphasize aseptic technique.
      (10) Remove the tourniquet.
      (11) Adjust the flow.
5. Care of the site and securing the IV
   a. Tape the needle in position over the wings.
   b. Cover with sterile dressing.
   c. Loop the tubing and secure it to the arm with tape. Emphasize:
      (1) Problems with securing the tape too tightly
      (2) The need to avoid circumferential taping
      (3) That the injection site should be readily available
   d. Splint the arm with a padded arm board.

NOTES

e. Label the IV and indicate:
   (1) Time and date
   (2) Type and gage of needle
f. Monitor the IV. Emphasize monitoring:
   (1) Patient's blood pressure
   (2) Fluid level in the IV fluid container
   (3) Fluid level in the drip chamber
   (4) Infiltration
   (5) Development of an air embolism in the administration set
   (6) A severed catheter

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 5.1.4.S: Procedure for Terminating an IV

NOTES

Equipment

Properly functioning IV on a practice arm
Sterile dressing
Bandages
Adhesive tapes

Procedure

Demonstrate on a practice arm the procedure for terminating a properly functioning IV.

Emphasize each step, including critical errors that can be made.

Be sure each student can see clearly.

Steps

1. Stop the flow by clamping the tubing.
2. Remove all tape. Emphasize the importance of not disturbing the catheter (needle) while removing the tape.
3. Place sterile dressing over injection site and remove catheter (needle). Emphasize:
   a. Removing the catheter flush with the skin.
   b. Avoiding jerky movements of the catheter.
   c. Applying firm pressure with sterile dressing during and for 5 minutes after removal of catheter.
   d. Being alert for prolonged bleeding in patients taking anticoagulant drugs (Coumadin).
4. After the bleeding has stopped, dress and bandage the venipuncture site.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

Demonstration 5.1.5.S: Procedure for Evaluating an IV That Is Not Flowing Properly

NOTES

Equipment

Improperly functioning IV on a practice arm

Procedure

Demonstrate the procedure for evaluating an IV that is not functioning properly.

Emphasize each step, including critical errors that can be made.

Be sure each student can see clearly.

Steps

1. Check for infiltration. Emphasize:
   a. Signs—hematoma, swelling, pain, redness
   b. Procedure to stop infiltration
2. Check the flow clamp.
3. Check the tubing for kinks or taping that is too tight.
4. Check the height of the IV bottle.
5. Check the air vent for patency by removing the air vent cap.
6. Check the needle for patency; if it is, lower the IV solution container and apply pressure to the flush ball.
7. Check the fluid level in the container.
   a. If less than 50 cc, replace the container.
   b. Describe the procedure for replacing a container.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

Demonstration 5.1.6.S: Procedure for the Removal of an Air Embolism From the Administration Set Tubing

NOTES

Equipment

Properly functioning IV
Hemostat
Syringe

Procedure

Set up the IV so that it is functioning properly, but the administration set tubing is filled with air.

Demonstrate the procedure for removing an air embolism from tubing.

Emphasize each step, including critical errors that can be made.

Be sure each student can see clearly.

Steps

1. Tighten the clamp to stop the flow.
2. Place a hemostat close to the infusion needle.
3. Connect the administration set to a full container of IV solution.
4. Insert the needle in the injection site. Emphasize aseptic technique.
5. Release the clamp and drain air from the tubing.
6. Determine if all the air has been removed. Describe:
   a. If yes, stop the flow, remove the needle and hemostat, and adjust the flow
   b. If no, remove the IV
7. Monitor the patient for signs of an air embolism. Emphasize:
   a. Signs of an air embolism
   b. Positioning the patient with a suspected embolism

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

Demonstration 5.1.7.S: Drawing Blood Samples

NOTES

Equipment

IV arm
Catheter-over-needle device
Alcohol swab
Syringe
Sample tubes

Procedure

Initiate venipuncture.
Demonstrate the procedure for drawing a blood sample.
Emphasize each step, including critical errors that can be made.
Be sure each student can see clearly.

Steps

1. Perform venipuncture (review Demonstration 5.1.2.S). Emphasize aseptic technique.
2. Before attaching the administration set, draw 25 cc of blood. Emphasize:
   a. Aseptic technique
   b. Rate of drawing the sample
3. Attach the administration set (review 5.1.2.S).
4. Place the sample in three vacutubes. Describe:
   a. Use of the vacutube
   b. Aseptic use of the needle and syringe
   c. Use of the two samples, that is, complete blood count and enzyme count
5. Label the samples with the patient's name, and tape the samples together.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

Demonstration 5.2.1.S: Application of the Military Anti-Shock Trousers

NOTES

Equipment

MAST
Two assistants (students)
Patient in supine position (student or manikin)
Long backboard

Procedure

Demonstrate the application of MAST.
Emphasize each step, including critical errors that can be made.
Be sure each student can see clearly.
Discuss removal of MAST.

Steps

1. Position MAST on backboard near patient. Lay them flat with half pleated.

   NOTE: Any patient with trauma severe enough to require MAST has a spinal injury until proven otherwise.

2. Position MAST under the patient. Describe:
   a. Position of assistants
   b. Technique of log rolling the patient
   c. Positioning of MAST under the patient
   d. Position of MAST on the patient
3. Secure MAST. Describe:
   a. Securing the garment around the lower extremities
   b. Securing the garment around the abdomen
   c. Position of MAST on the patient
4. Inflate MAST. Describe:
   a. Foot pump
   b. Shutoff valves
   c. Pressure valves
   d. Internal pressure generated
5. Monitor the patient. Describe:
   a. Effects of the application of MAST

(1) On state of consciousness
(2) On blood pressure

b. Procedure for deflating MAST—emphasize monitoring before deflated. Should be deflated only under direction of physician.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Practice Session 1

Equipment

Winged infusion needles (one per student)
Administration sets (one per student)
Intravenous solutions (one per student)
Alcohol swabs (one box)
Iodine pads (one box)
Rubber tubing tourniquets (one for every two students)
Padded arm board (one for every two students)
Sterile dressing (one box)
Adhesive tape
Antiseptic ointment

Skills—From Demonstrations

5.1.1.S Venipuncture Using a Winged Infusion Needle (butterfly)
5.1.4.S Procedure for Terminating an IV

Procedure

Each student selects a partner and attempts to start an IV on his partner. The instructor should provide step-by-step instruction during the first attempt.

Practice Session 2

Equipment

Winged infusion needles (two per student)
Catheter-over-needle device (two per student)
Catheter-through-needle device (two per student)*
Administration sets (regular) (one per student)
Administration sets (pediatric—minidrip) (one per student)
Intravenous solutions (two per student)
Alcohol swabs (one box)
Iodine swabs (one box)

*Indicates optional skill.

NOTES

Padded arm boards (5)
Rubber tubing tourniquets (10)
Blood sample vacutubes (20)
Disposable syringes (20)
18-gage needles (10)
Adhesive tape (3 rolls)
Sterile dressings
Antiseptic ointment
IV practice arm(s)
MAST
Manikin

Skills—From Demonstrations

5.1.2.S Venipuncture Using an Over-the-Needle Catheter Device
5.1.3.S* Venipuncture Using a Through-the-Needle Catheter Device
5.1.4.S Procedure for Terminating an IV
5.1.5.S Procedure for Evaluating an IV That Is Not Flowing Properly
5.1.6.S Procedure for the Removal of an Air Embolism from the Administration Set Tubing
5.1.7.S Drawing Blood Samples
5.2.1.S Application of the Military Anti-Shock Trousers

Procedure

The instructor should have the following practice stations:

- IV arm (two stations)—each student practices
  - — Starting an IV using over-the-needle catheter
  - — Starting an IV using through-the-needle catheter
  - — Drawing blood samples
  - — Terminating an IV
- IV arm—each student should practice evaluating a malfunctioning IV. Fellow students should be responsible for creating the malfunctions.

*Indicates optional skill.

NOTES

- IV arm—each student should practice removing an air embolism from the administration set.
- MAST—students in groups of three should practice the application and deflation of the MAST on a fellow student or manikin.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.1.1.S: Venipuncture Using a Winged Infusion Needle

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform each skill.

Equipment

Winged infusion needle
Administration set
IV solution
Tourniquet
Alcohol swabs
Antiseptic ointment
Sterile dressing
Adhesive tape
Padded arm board

Procedure

Each student should select a partner and be given all equipment to establish a life line.

Under the supervision of the instructor, the student should initiate an IV using a winged infusion device.

The IV will be considered successful if it is running at a flow rate within 3 gtt/min of the stipulated flow rate and infiltration is not present.

The instructor should stipulate the flow rate at 60 gtt/min.

Steps

___ ___ ___ A. Explain to the patient what is going to occur.

NOTES

___ ___ ___ B. Prepare the administration set and IV solution:

___ ___ ___ 1. Remove the protective cap and seal of the IV bottle.

___ ___ ___ 2. Insert the plunger of the IV administration set into the IV bottle.

___ ___ ___ 3. Attach the needle to the administration set.

___ ___ ___ 4. Fill the drip chamber half full and bleed the administration tubing and needle.

___ ___ ___ 5. Hang the container 3 to 4 feet above the patient.

___ ___ ___ C. Let the victim's arm hang down.

___ ___ ___ D. Apply a tourniquet to the upper arm.

___ ___ ___ E. Select a puncture site.

___ ___ ___ F. Prepare the site by wiping with an iodine wipe in a circular motion away from the site.

___ ___ ___ G. Perform venipuncture.

___ ___ ___ 1. Stabilize the vein using the thumb of the opposite hand.

___ ___ ___ 2. Grip the wings of the needle and puncture the skin above the vein at a 45° angle and then level.

___ ___ ___ 3. Enter the vein lumen.

___ ___ ___ 4. Feed the needle into the vein.

NOTES

___ ___ ___ H. Remove the tourniquet.

___ ___ ___ I. Adjust the flow to 30 gtt/min. (Note: Instructor should stipulate the flow rate of 30 gtt/min.)

___ ___ ___ J. Tape the needle in position.

___ ___ ___ K. Cover with sterile dressing.

___ ___ ___ L. Loop the tubing and tape to the arm. (Note: Injection site should be readily available.)

___ ___ ___ M. Splint the arm with an arm board and secure in position.

NOTES

Student's name_____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.1.2.S: Venipuncture Using Over-the-Needle Catheter

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence or omitted. The student should be given three attempts to perform each skill.

Equipment

Catheter-over-needle device (18-gage)
Administration set (microdrip)
IV solution (5-percent D/W)
Tourniquet
Alcohol swabs
Sterile dressing (one box)
Adhesive tape (1/2- and 1-inch widths)
Padded arm board
IV practice arm

Procedure

Under the supervision of the instructor, the student should initiate an IV using an over-the-needle catheter device.

The IV will be considered successful if it is running at a flow rate within 3 gtt/min of the stipulated flow rate and infiltration is not present.

The instructor should stipulate the flow rate at 60 gtt/min.

Steps

___ ___ ___ A. Explain to the patient what is going to occur.

NOTES

___ ___ ___ **B. Prepare the administration set:**

___ ___ ___ 1. Remove the protective cap and seal of the IV bottle.

___ ___ ___ 2. Insert the plunger of the IV administration set into the IV bottle.

___ ___ ___ 3. Fill the drip chamber half full and bleed the administration line.

___ ___ ___ 4. Hang the bottle 3 to 4 feet above the patient and replace the protective cap and adapter end.

___ ___ ___ **C. Let the victim's arm hang down.**

___ ___ ___ **D. Apply a tourniquet to the upper arm.**

___ ___ ___ **E. Select a puncture site.**

___ ___ ___ **F. Prepare the site by wiping with a bentadyne wipe in a circular motion away from the site.**

___ ___ ___ **G. Perform venipuncture:**

___ ___ ___ 1. Stabilize the vein using the thumb of the opposite hand.

___ ___ ___ 2. Grip the needle and puncture the skin slightly to the side of the vein.

___ ___ ___ 3. Enter the vein lumen.

___ ___ ___ 4. Feed the catheter down the needle and remove the needle.

NOTES

___ ___ ___ H. Attach the catheter hub to the administration set.

___ ___ ___ I. Remove the tourniquet.

___ ___ ___ J. Adjust the flow to 30 gtt/min. (Note: Instructor will stipulate the flow rate.)

___ ___ ___ K. Tape the catheter hub and adapter to the arm using 1/2-inch tape. (Note: Hub and adapter should be taped independently so they may be separated.)

___ ___ ___ L. Cover with sterile dressing.

___ ___ ___ M. Loop the tubing and tape it securely to the arm. (Note: Injection site should be readily available.)

___ ___ ___ N. Splint the arm with an arm board and secure the arm in position.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.1.3.S:* Venipuncture Using a Catheter-Through-Needle Device

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform each skill.

Equipment

Catheter-through-needle device
Administration set
IV solution
Tourniquet
Alcohol swabs (or) bentadyne wipes
Antiseptic ointment
Sterile dressing
Adhesive tape

Procedure

Under the supervision of the instructor, the student should initiate an IV using a through-the-needle catheter device.

The IV will be considered successful if it is running at a flow rate within 3 gtt/min of the stipulated flow rate and infiltration is not present.

The instructor should stipulate the flow rate at 60 gtt/min.

Steps

___ ___ ___ A. Explain to the patient what is going to occur.

*Indicates optional skill.

NOTES

___ ___ ___ B. Prepare the administration set.

___ ___ ___ 1. Remove the protective cap and seal of the IV bottle.

___ ___ ___ 2. Insert the plunger of the IV administration set into the IV bottle.

___ ___ ___ 3. Fill the drip chamber half full and bleed the administration line.

___ ___ ___ 4. Hang the bottle 3 to 4 feet above the patient and replace the protective cap and adapter end.

___ ___ ___ C. Position the victim's arm.

___ ___ ___ D. Apply the tourniquet to the upper arm.

___ ___ ___ E. Select the puncture site.

___ ___ ___ F. Prepare the site by wiping with a bentadyne wipe in a circular motion away from site.

___ ___ ___ G. Perform venipuncture:

___ ___ ___ 1. Stabilize the vein using the thumb of the opposite hand.

___ ___ ___ 2. Grip the needle and puncture the skin slightly to the side of the vein.

___ ___ ___ 3. Enter the vein lumen.

___ ___ ___ 4. Feed the catheter through the needle into the vein.

NOTES

___ ___ ___ 5. Apply pressure on the vein to secure the catheter and withdraw the needle.

___ ___ ___ 6. Place a protective clip over the needle at its injunction with the catheter.

___ ___ ___ 7. Apply sterile dressing over the puncture site.

___ ___ ___ H. Attach the catheter hub to the administration set.

___ ___ ___ I. Remove the tourniquet.

___ ___ ___ J. Adjust the flow to 30 gtt/min. (Note: Instructor will stipulate the flow rate.)

___ ___ ___ K. Position the shield over the needle bevel and catheter, and secure in place.

___ ___ ___ L. Tape the catheter hub and adapter to the arm using 1/2-inch tape. (Note: Hub and adapter should be taped independently so they may be separated.)

___ ___ ___ M. Cover with sterile dressing.

___ ___ ___ N. Loop the tubing and tape securely to the arm. (Note: Injection site should be readily available.)

___ ___ ___ O. Splint the arm with an arm board and secure in position.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.1.4.S: Procedure for Terminating an IV

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform each skill. (Note: This evaluation can be done in conjunction with Skill Evaluation 5.1.1.S, 5.1.2.S, or 5.1.3.S.)

Equipment

Properly functioning IV on a practice arm
Sterile dressing
Bandages
Adhesive tape

Procedure

Using an IV started as part of Skill Evaluation 5.1.1.S, 5.1.2.S, or 5.1.3.S, have the student terminate the IV.

The termination will be considered effective if no hematoma forms.

Steps

___ ___ ___ A. Stop the flow by clamping the tubing.

___ ___ ___ B. Remove all tape being sure not to disturb the catheter (needle)

___ ___ ___ C. Place sterile dressing over the injection site and gently remove the catheter (needle).

___ ___ ___ D. Apply pressure quickly and firmly and elevate the extremity. *Do not rub.*

___ ___ ___ E. After bleeding has stopped, dress and bandage the venipuncture site.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.1.5.S: Procedure for Evaluating an IV That Is Not Functioning Properly

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform each skill.

Equipment

Improperly functioning IV

Procedure

Create a problem in the IV.

Mark this sheet for each attempt according to the following key. Any problem used should have two keyed marks for each attempt.

- Problem was present in this attempt.
- Student did not identify the problem.
- Student identified the problem, but did not correct it.
- Student identified the problem and corrected it.

Attempts			Problems
1	2	3	
___	___	___	Flow clamp was closed
___	___	___	Height of the IV container was too low
___	___	___	Needle was not patent
___	___	___	Tubing was kinked or pinched

NOTES

___ ___ ___ Air vent was not patent

___ ___ ___ Tourniquet was still in place

___ ___ ___ Needle was not in the vein

___ ___ ___ No IV fluid in the container

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.1.6.S: Removal of an Air Embolism From the Administration Tubing

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence or omitted. The student should be given three attempts to perform each skill.

Equipment

Properly functioning IV
Hemostat
Syringe

Procedure

Set up a functioning IV, but drain all fluid from the tubing.
Have a student remove an air embolism.
Removal of air will be considered effective if less than 1/2 inch of tubing is filled with air following the procedure.

Steps

___ ___ ___ A. Tighten the clamp to stop the flow.

___ ___ ___ B. Place the hemostat close to the infusion needle.

___ ___ ___ C. Connect the administration set to a full container of IV solution.

___ ___ ___ D. Insert the needle in the injection site.

___ ___ ___ E. Release the clamp and drain the air from the tubing.

NOTES

___ ___ ___ F. Stop the flow, remove the needle and hemostat.

___ ___ ___ G. Adjust the flow.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.1.7.S: Drawing Blood Samples

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform each skill. (Note: This evaluation can be done in conjunction with Skill Evaluation 5.1.2.S or 5.1.3.S.)

Equipment

IV arm
Catheter-over-needle device
Alcohol swab
Syringe
Sample tubes

Steps

___ ___ ___ A. Perform venipuncture (Skill 5.1.2.S or 5.1.3.S).

___ ___ ___ B. Before attaching the administration set, draw 25 cc of fluid.

___ ___ ___ C. Attach the administration set and adjust the flow (Skill 5.1.2.S or 5.1.3.S).

___ ___ ___ D. Place the samples in three tubes.

___ ___ ___ E. Label the samples with the patient's name and ID number and tape them together.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.2.1: Application of Military Anti-Shock Trousers

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform each skill.

Equipment

MAST
Two assistants (students)
Patient in supine position (student)
Long backboard

Procedure

Place the patient on the floor in a supine position.

Have the student being evaluated direct the assistants in applying MAST.

Steps—To Inflate

___ ___ ___ A. Unfold the MAST and lay them flat. Then, pleat half of the MAST and position along the patient's side.

___ ___ ___ B. Rescuers position themselves on the opposite side of patient from the MAST and log roll the patient toward the rescuers.

___ ___ ___ C. Position the MAST under the patient and return the patient to a supine position.

NOTES

NOTES

___ ___ ___ D. Move to the other side of the patient, log roll the patient again, position the MAST, and return the patient to a supine position. (Note: The top of the garment should be just below the lowest rib.)

___ ___ ___ E. Wrap the left leg of the garment around the patient's left leg and secure with Velcro strips.

___ ___ ___ F. Wrap the right leg of the garment around the patient's right leg and secure with Velcro strips. (Note: It is not important whether the left or right leg is secured first.)

___ ___ ___ G. Wrap the abdominal section of garment around the abdomen and secure with Velcro strips.

___ ___ ___ H. Attach a foot pump to all three valves and open all stopcocks.

___ ___ ___ I. Inflate the MAST until air is released through the relief valves or velcro begins to crackle.

___ ___ ___ J. Close the stopcocks.

___ ___ ___ K. Remove the foot pump.

(Note: Student should check to be sure each section of the garment is being inflated simultaneously.)

Steps—To Deflate

___ ___ ___ L. Monitor the vital signs. (It is only necessary for the student to indicate he would do this.)

___ ___ ___ M. *Slowly* release pressure in the abdominal section, while monitoring the vital signs.

___ ___ ___ N. *Slowly* release the pressure in each leg, while monitoring the vital signs.

The student should be asked the following questions. He need only respond to each question once, even though it may be necessary for him to repeat the skill.

- What should be done before deflating the MAST suit?
  Appropriate answer: The patient's condition must be stabilized including procedures for fluid replacement.
- What should be done while the MAST suit is being deflated?
  Appropriate answer: The patient's vital signs should be monitored during the procedure.

NOTES

UNIT 6 emt-p

CLINICAL EXPERIENCE

NOTES

Description of Unit

In the previous units, the students were trained to perform skills in simulated situations in the classroom. The purpose of the clinical experience is to provide the student with the opportunity to become proficient in the skills presented in the classroom setting.

If a number of modules are being presented together, it is not necessary for the clinical experience to be presented after each one. The clinical experience associated with each module can be combined and presented upon completion of the classroom sessions.

Objectives

The following objectives are proposed for the clinical experience. Because of patient availability, it is possible that all skills listed below may not be performed by the student, but as many skills as possible should be observed and practiced by the student under the supervision of the preceptor.

Emergency Department

During the experience in the emergency department, the student will have the opportunity to practice on actual patients under direct supervision and proficiently demonstrate, to the satisfaction of the preceptor, each of the following:

- Performance of peripheral intravenous (IV) insertion using an over-the-needle catheter or a winged infusion needle

- Drawing blood samples
- Performance of subclavian or internal jugular IV insertion*

Operating/Recovery Room

During the experience in the operating/recovery room, the student will have the opportunity to practice on actual patients under direct supervision and proficiently demonstrate, to the satisfaction of the preceptor, the following skill:

- Performance of peripheral IV insertion on an adult or pediatric patient using an over-the-needle catheter device, through-the-needle catheter device, or winged infusion needle

IV Team

During the experience with the IV team, the student will have the opportunity to practice on actual patients under direct supervision and proficiently demonstrate, to the satisfaction of the preceptor, each of the following:

- Demonstration of aseptic technique
- Performance of peripheral IV insertion using a winged infusion needle, over-the-needle catheter device, or through-the-needle catheter device on adults and, when possible, infants
- Drawing blood samples for blood sugar, electrolytes, type and cross-match, and complete blood count analysis

Upon completion of the clinical experience, the trainee should be involved in a supervised internship on the vehicle. During this internship, the trainee will be supervised by a preceptor (physician, nurse, or certified emergency medical technician) in the skills presented during the training program. Guidelines for this internship are identical to those presented for the other clinical areas, and should be used as a reference.

Preceptor Activities

Review the objectives with the course coordinator and discuss which objectives are to be included in the unit activities. If the preceptor has any questions concerning specific skills or procedures, he should be referred to the appropriate module for a review of the materials presented to the students.

*Indicates optional skill.

NOTES

Have the student sign in and determine his proper attire, for example, sterile greens.

Review the rules and operating procedures with the team, making certain to define the student's role with the team. Any special regulations concerning the student's activities should be defined.

Define those skills that will and will not be included in this instructional unit, but were discussed during the classroom activities.

Review the history, diagnosis, complications, and treatment of each patient with the team. The activities of the student should not be limited to those specifically defined in the objectives.

For each activity, demonstrate the skill initially, then coach the student through the skill at least one time. Finally, observe the student as he performs the skill.

Observe the student when he is performing activities with the team. The preceptor should critically review the student's technique and suggest corrections when appropriate.

Assist and evaluate the student until he is competent in each activity on the checklist.

Answer any of the student's questions concerning activities with the team or specific patients and their conditions.

Review the objectives for this instructional unit periodically, and discuss the student's progress with respect to the items on the checklist.

Mark the student's activities checklist after each clinical session. The checklist should be marked indicating the number of total observations (O), total attempts to perform the activity by the student (T), and the number of successful attempts (S) for each activity. Once the student has demonstrated the skill to the satisfaction of the preceptor, the session number during which the preceptor made the evaluation should be entered in the "Completed" column. Any comments should be listed in the appropriate space. Specifically, comment should be made if the student does not become proficient at any given skill. Once the student has successfully demonstrated his proficiency at a given skill, however, he should still continue to perform the skill while with the team.

Student Activities

The student should:

- Report to the specialty unit on his scheduled date and shift and "sign in" with the supervisor

NOTES

- Review the rules and operating procedures within the unit with the preceptor, making certain that his role in the unit is defined.
- Review the history, diagnosis, complications, and treatment of each patient in the unit
- Observe and participate in unit activities as directed by the preceptor. (If the student observes a technique of procedure performed differently from its presentation during the classroom activities, he may question the preceptor about differences observed, but remember that the techniques presented during the lecture may not be the only correct method.)
- Perform each activity on the checklist (when appropriate) under the direct supervision of the preceptor. (If the student is unsure of the activity, the preceptor will demonstrate the skill.)
- Review each activity performed with the preceptor, and be sure the preceptor critiques his performance
- Be sure the preceptor marks the checklist after each clinical session
- Develop a log on each patient seen during the experience—the log should include the following information as a minimum:

  — Patient's record identification—use identification number rather than patient's name
  — Major problem—that is, trauma, acute appendicitis
  — Complications
  — Skills and activities observed
  — Skills performed—that is, initiated IV, monitored cardiac activity

The preceptor and the student should review the objectives in the instructional unit and discuss which activities will be included in the experience.

NOTES

Emergency Department

Student's name _____

Com-pleted	Activities (objectives)	Session number														Comments
		1			2			3			4			5		
		O	T	S	O	T	S	O	T	S	O	T	S	O	T	S	
	Perform peripheral IV Over-the-needle catheter Winged infusion needle Through-the-needle catheter* Draw blood samples															
	Preceptor															
	Date															

*Indicates optional skill.

Note.—O = observations; T = student attempts; S = successful attempts.

Operating/Recovery Room

Student's name _____

Completed	Activities (objectives)	Session number 1 O	1 T	1 S	2 O	2 T	2 S	3 O	3 T	3 S	4 O	4 T	4 S	5 O	5 T	5 S	Comments
	Perform peripheral IV Over-the-needle catheter Winged infusion needle Through-the-needle catheter* Draw blood samples																
	Preceptor																
	Date																

*Indicates optional skill.
Note.—O = observations; T = student attempts; S = successful attempts.

CLINICAL TRAINING CHECKLIST

IV Team

Student's name _____

Completed	Activities (objectives)	Session number 1 O	1 T	1 S	2 O	2 T	2 S	3 O	3 T	3 S	4 O	4 T	4 S	5 O	5 T	5 S	Comments
	Demonstrate aseptic technique																
	Demonstrate aseptic technique																
	Perform peripheral IV Over-the-needle catheter Winged infusion needle Through-the-needle catheter*																
	Draw blood samples																
	Preceptor																
	Date																

*Indicates optional skill.

Note.—O = observations; T = student attempts; S = successful attempts.

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